

Answer on Question #46036, Physics, Electromagnetism

A wire with resistance of 8.0Ω is drawn out through a die so that its new length is three times its original length. Find the resistance of the longer wire assuming that the resistivity and density of the material are unaffected by the drawing process.

Resistance of a piece of wire is:

$$R_l = \rho \frac{l}{S_l}$$

Where ρ - is the specific electrical resistance; l - is the length of the conductor, S_l - is the cross-section area of the conductor.

After change in the wire length:

$$R_{3l} = \rho \frac{3l}{S_{3l}}$$

After drawn out through a die ρ and volume $V = Sl$ of a wire will be the same.

Then, using first equation:

$$R_l = \rho \frac{l^2}{V}$$

Using second and first equation:

$$R_{3l} = \rho \frac{9l^2}{V} = 9R_l = 9 \cdot 80\text{hm} = 720\text{hm}$$

Answer: resistance of the longer wire is $R_{3l} = 72 \text{ Ohm}$